US009429270B2

(12) **United States Patent**
Dawson

(10) **Patent No.: US 9,429,270 B2**
(45) **Date of Patent: Aug. 30, 2016**

(54) **BEARING GREASE PACKER**

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(72) Inventor: **Noel Lindsay Dawson**, Mudgee (AU)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 246 days.

(21) Appl. No.: **14/248,395**

(22) Filed: **Apr. 9, 2014**

(65) **Prior Publication Data**

US 2014/0318899 A1 Oct. 30, 2014

Related U.S. Application Data

(62) Division of application No. 12/598,291, filed on Oct. 30, 2009, now Pat. No. 8,720,647.

(51) **Int. Cl.**

F16N 3/10	(2006.01)
F16N 11/10	(2006.01)
F16N 37/00	(2006.01)
F16C 33/66	(2006.01)
F16C 19/36	(2006.01)

(52) **U.S. Cl.**

CPC ***F16N 3/10*** (2013.01); ***F16C 33/6622*** (2013.01); ***F16N 11/10*** (2013.01); ***F16N 37/003*** (2013.01); *F16C 19/364* (2013.01)

(58) **Field of Classification Search**

CPC F16C 19/364; F16C 33/6622; F16C 33/6625; F16N 11/10; F16N 37/003; F16N 3/10

USPC 184/5.1, 6.1, 6.5, 55.1, 57, 105.2; 134/136

See application file for complete search history.

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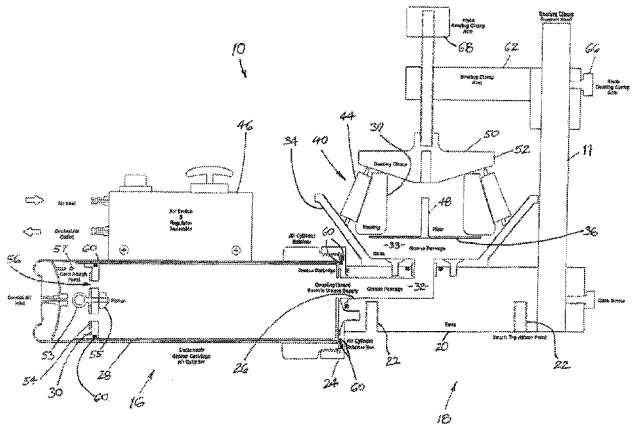
(57) **ABSTRACT**

A bench top bearing packer tool includes supply means for delivering a controlled amount of grease, support means for locating a bearing in a position where a bearing cage and rollers of the bearing may be lubricated with the grease delivered by the supply means, the supply means having a grease delivery outlet communicating with a grease livery inlet of the support means by a grease flow passageway, and a means for controlling the passage of grease through the inlet to the bearing cage and rollers of the bearing.

15 Claims, 15 Drawing Sheets



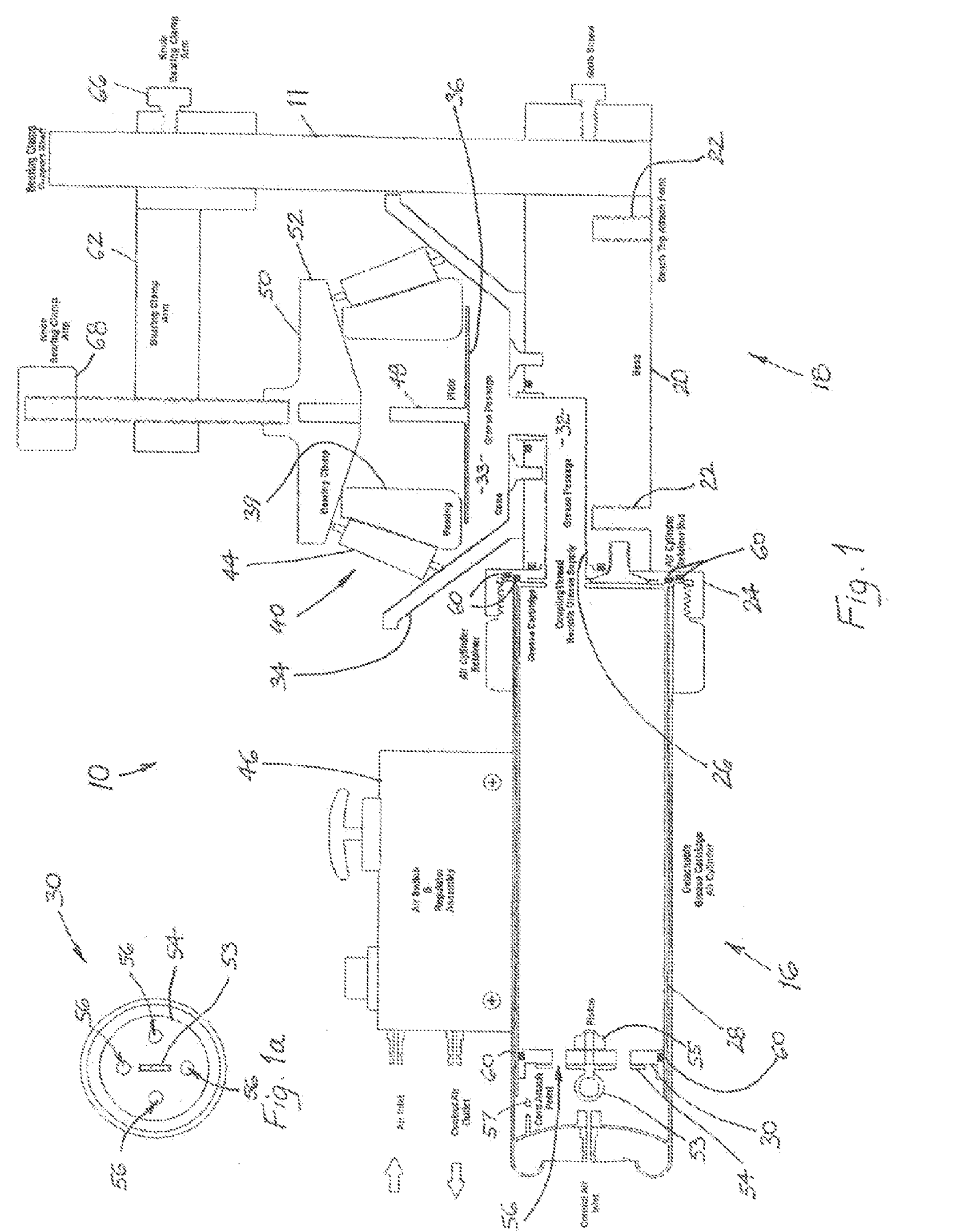


Fig. 1

Fig. 1a

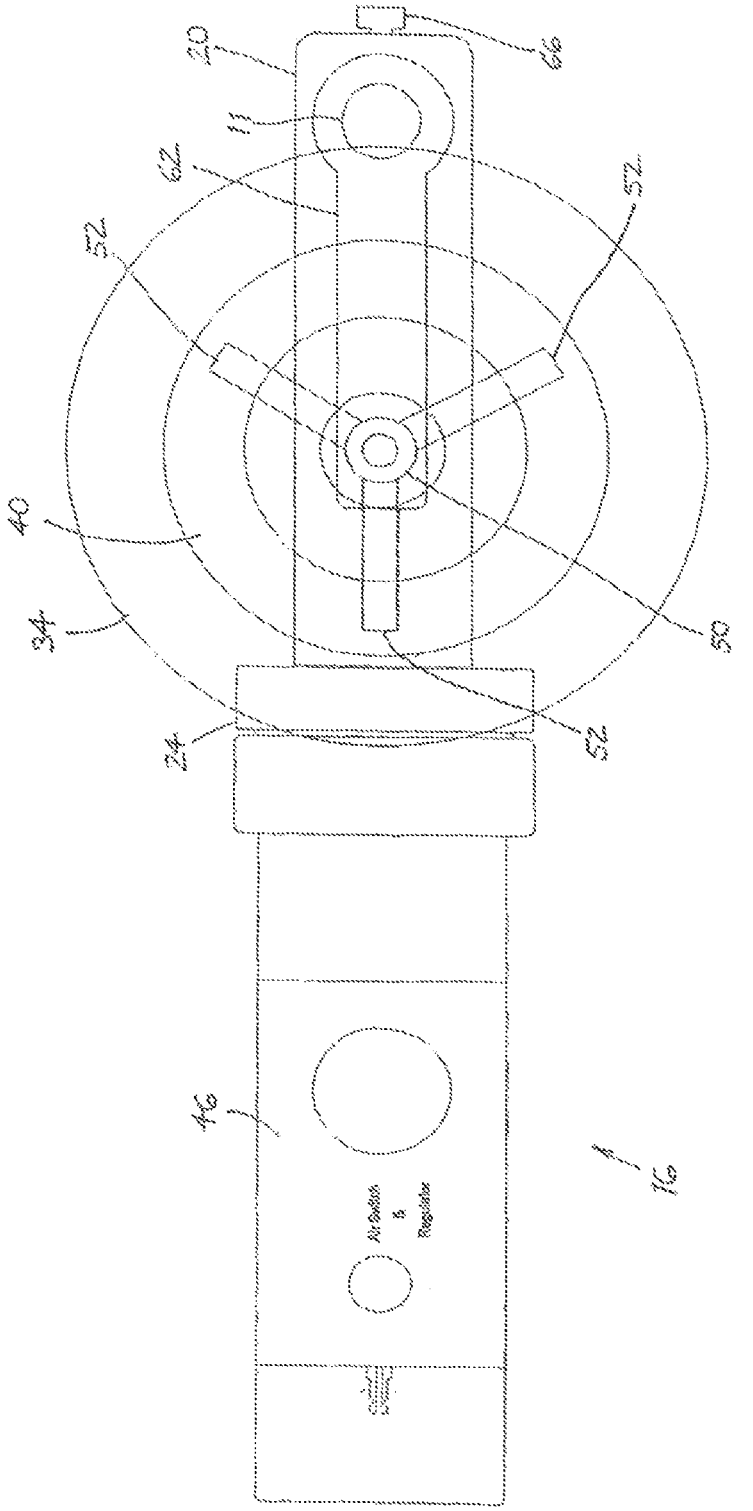


Fig. 2

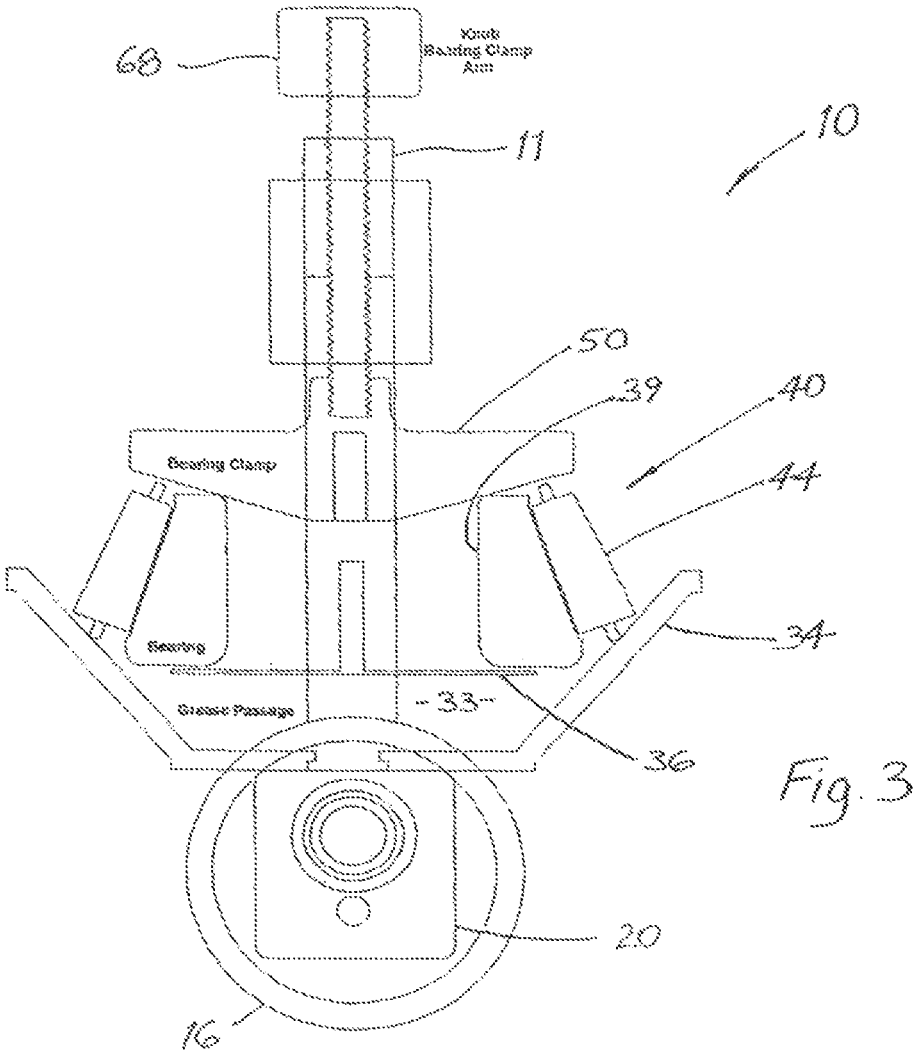

60
Kayak Bearing Clamp Arm
11
10
50
39
40
Bearing Clamp
44
Bearing
34
Bracket Passage
33
36
20
16

Fig. 3

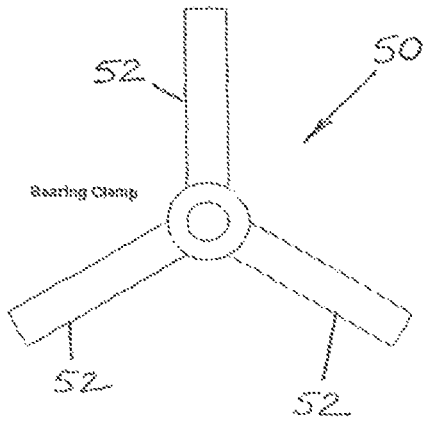

52
50
Bearing Clamp
52
52

Fig. 4

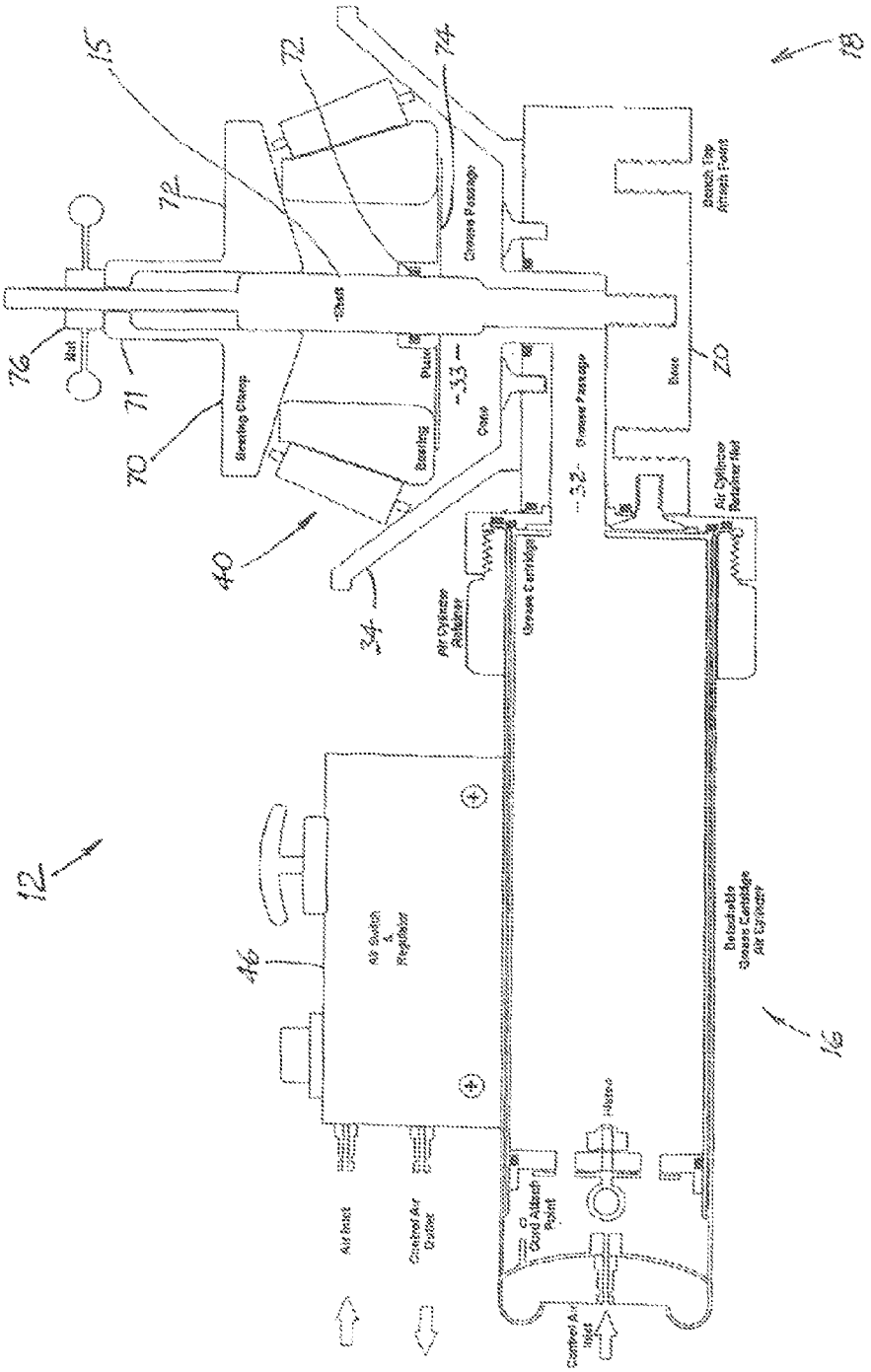


Fig. 5

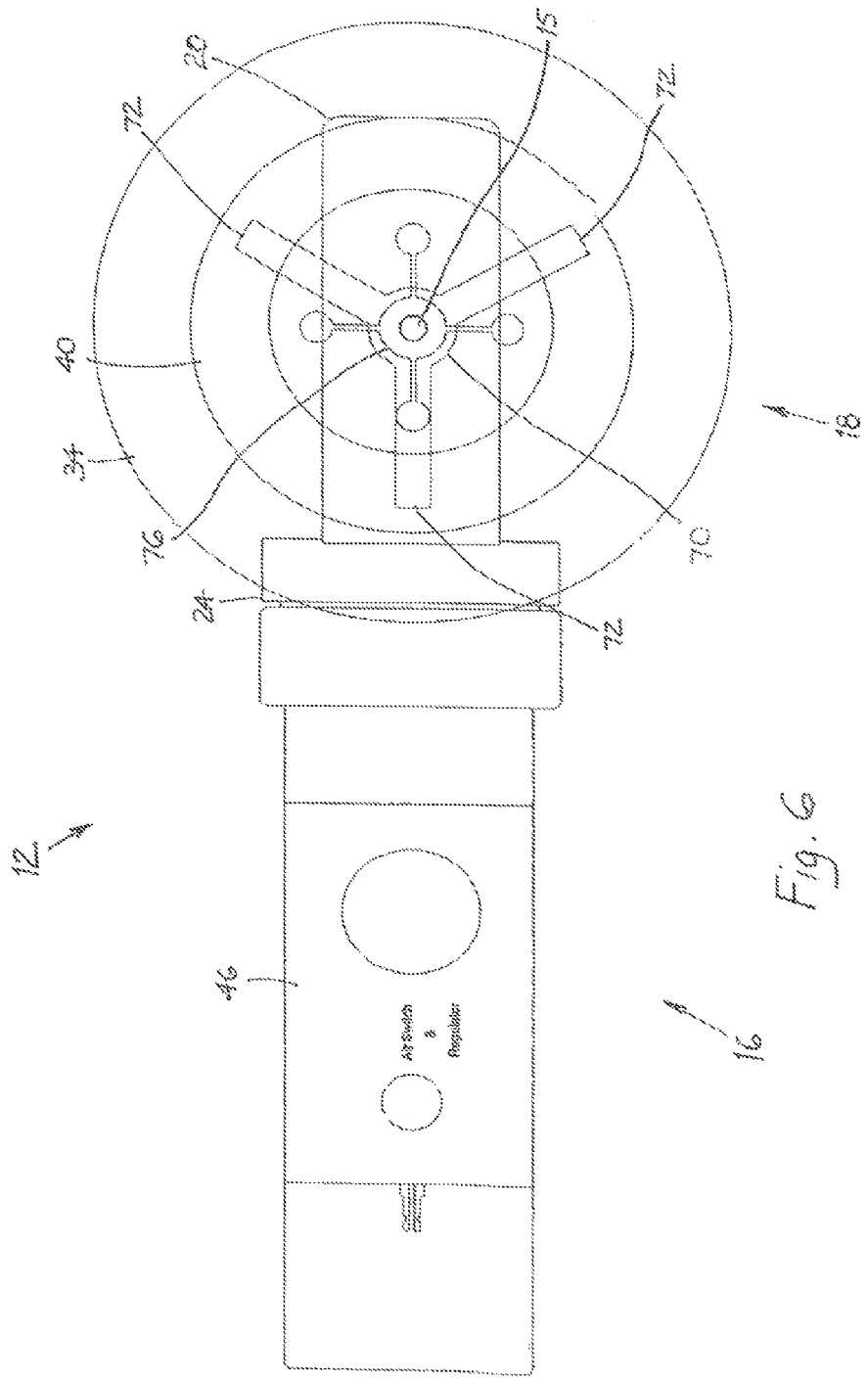


Fig. 6

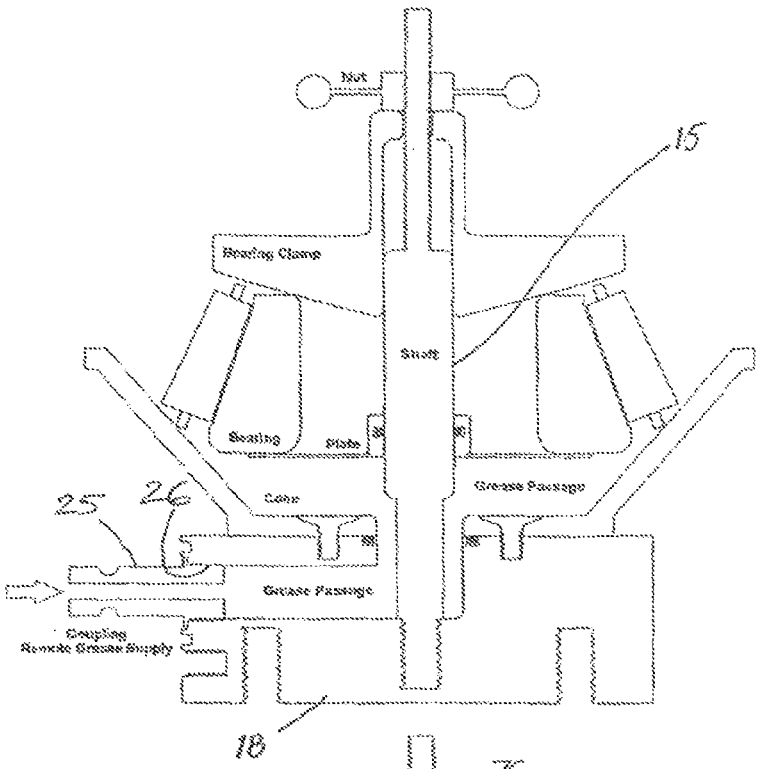

14
15
Nut
Bearing Clamp
Shaft
Bearing
Plate
Grease Passage
Collar
25
26
Grease Passage
Coupling
Remote Grease Supply
18

Fig. 8

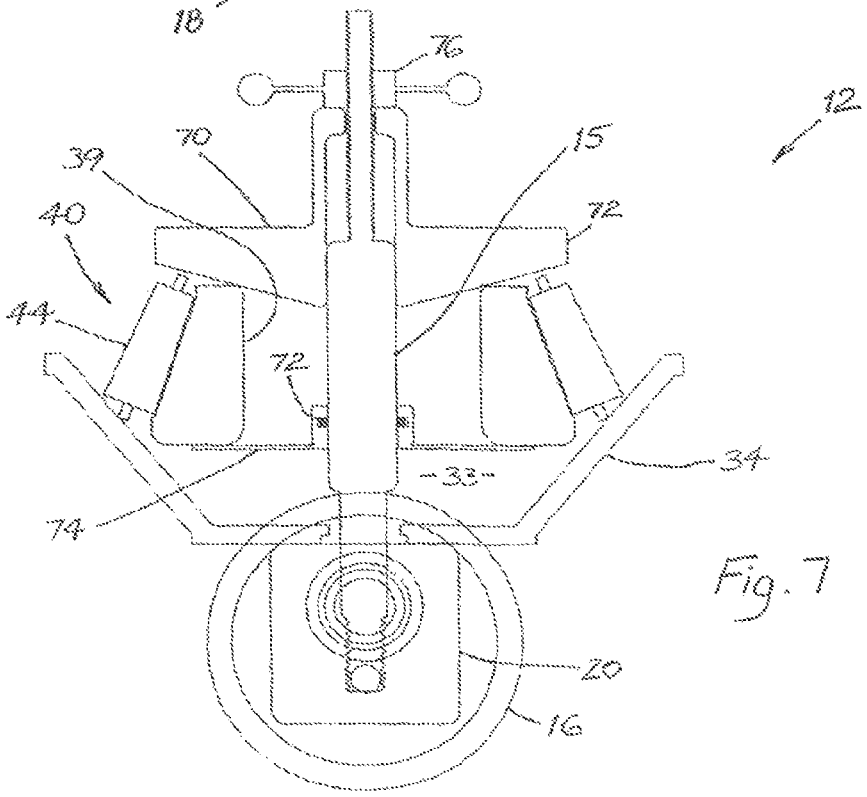

76
12
70
15
39
72
40
44
72
34
32
74
20
16

Fig. 7

Fig. 9

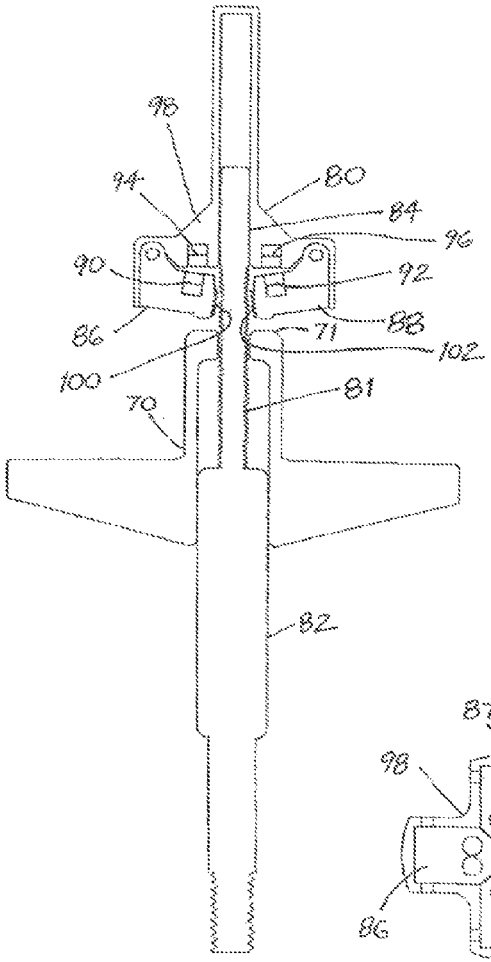
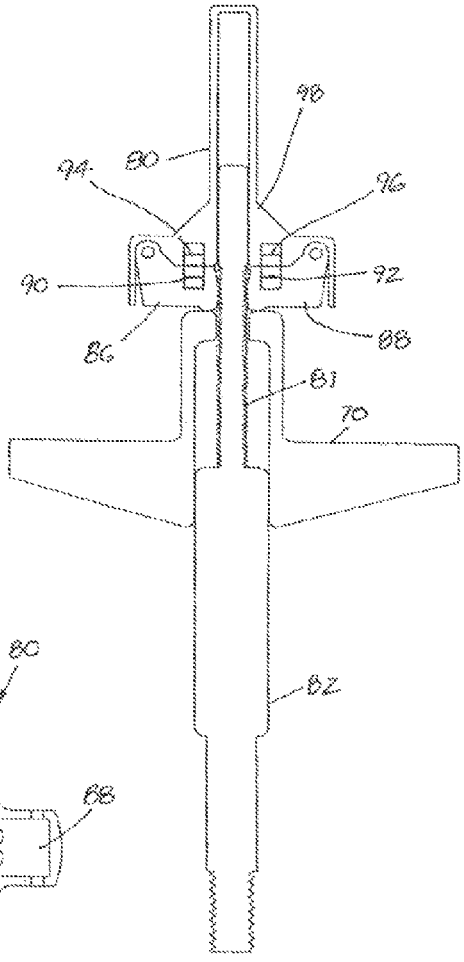


Fig. 10



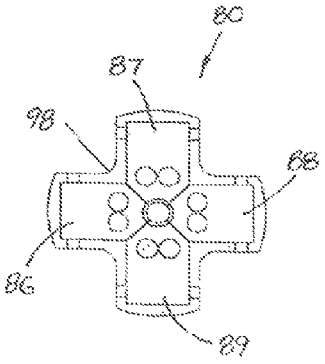


Fig. 11

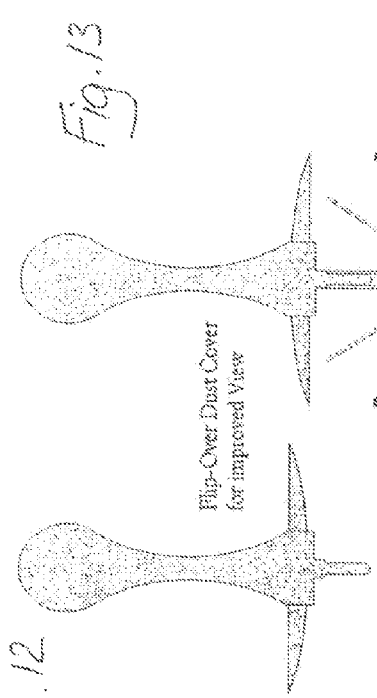


Fig. 12

Fig. 13

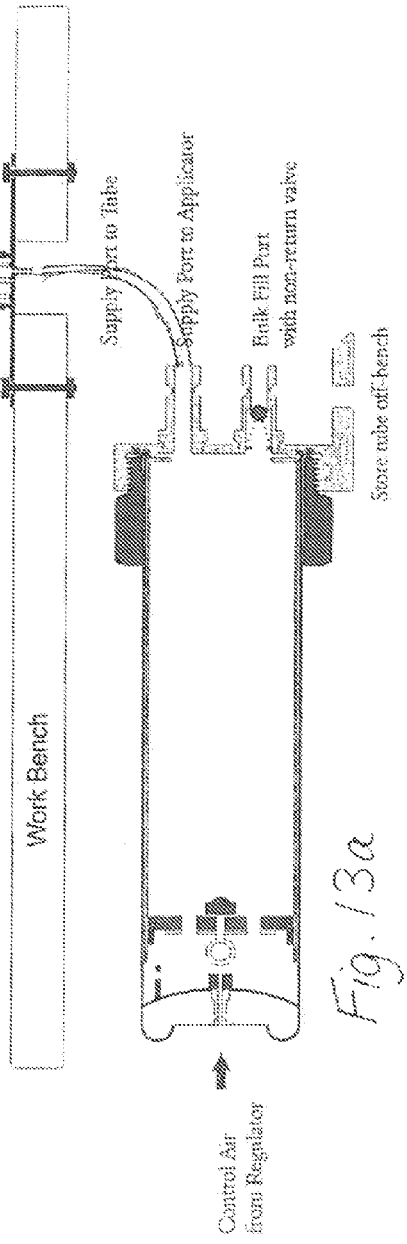
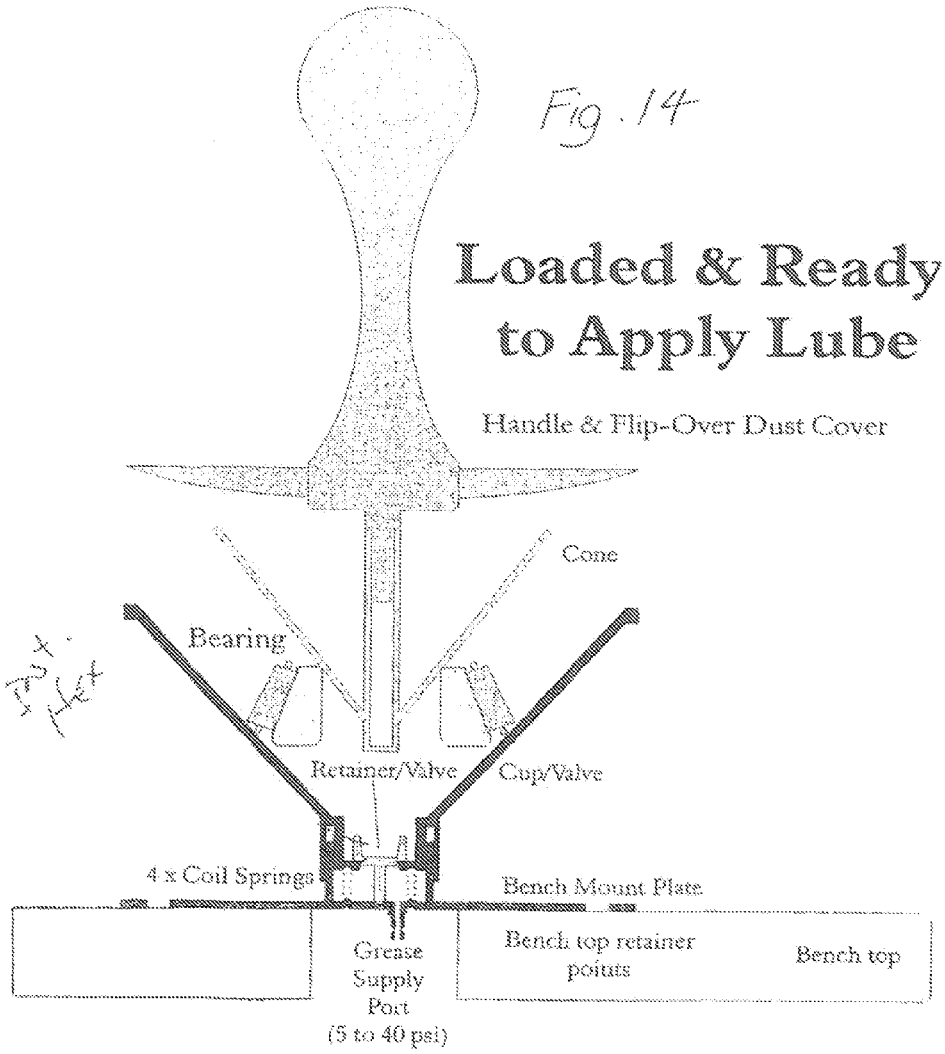


Fig. 13a

Fig. 14


Loaded & Ready to Apply Lube
Handle & Flip-Over Dust Cover
Cone
Bearing
Retainer/Valve
Cup/Valve
4 x Coil Springs
Bench Mount Plate
Grease Supply Port (5 to 40 psi)
Bench top retainer points
Bench top

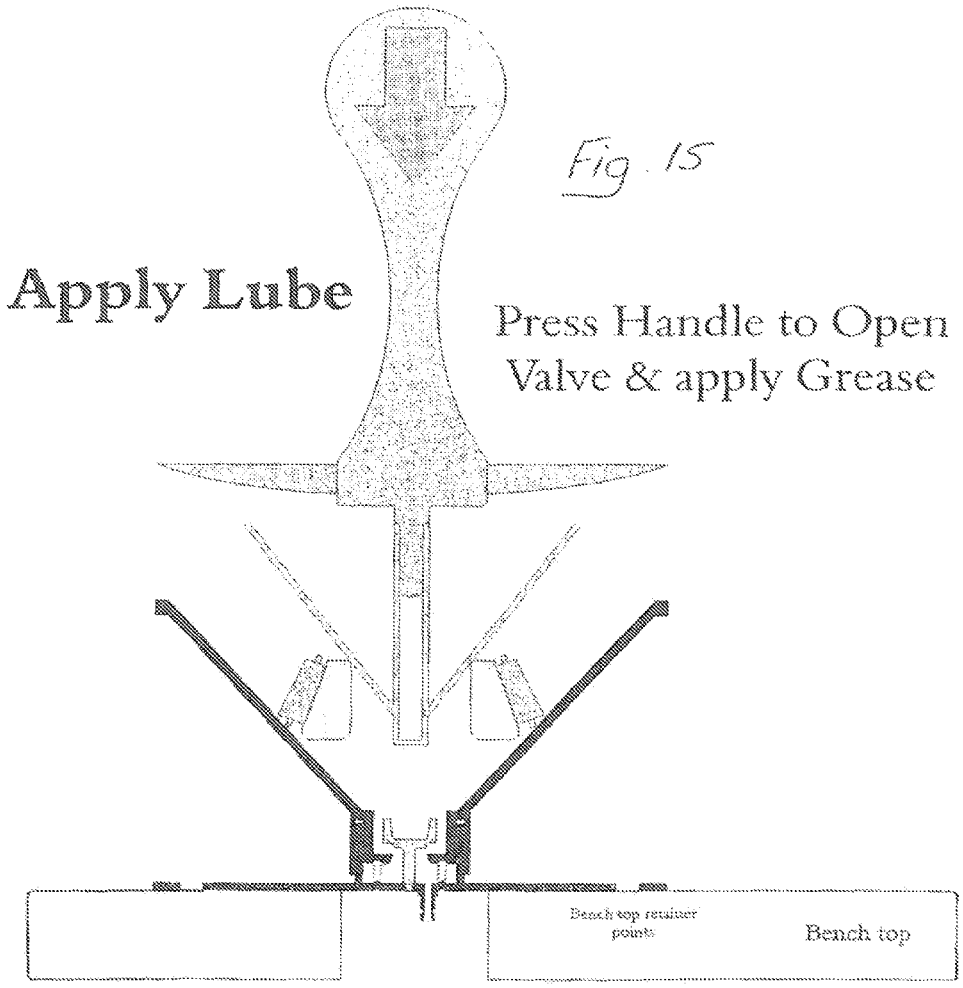

Apply Lube
Press Handle to Open
Valve & apply Grease
Bench top retainer points
Bench top

Fig. 15

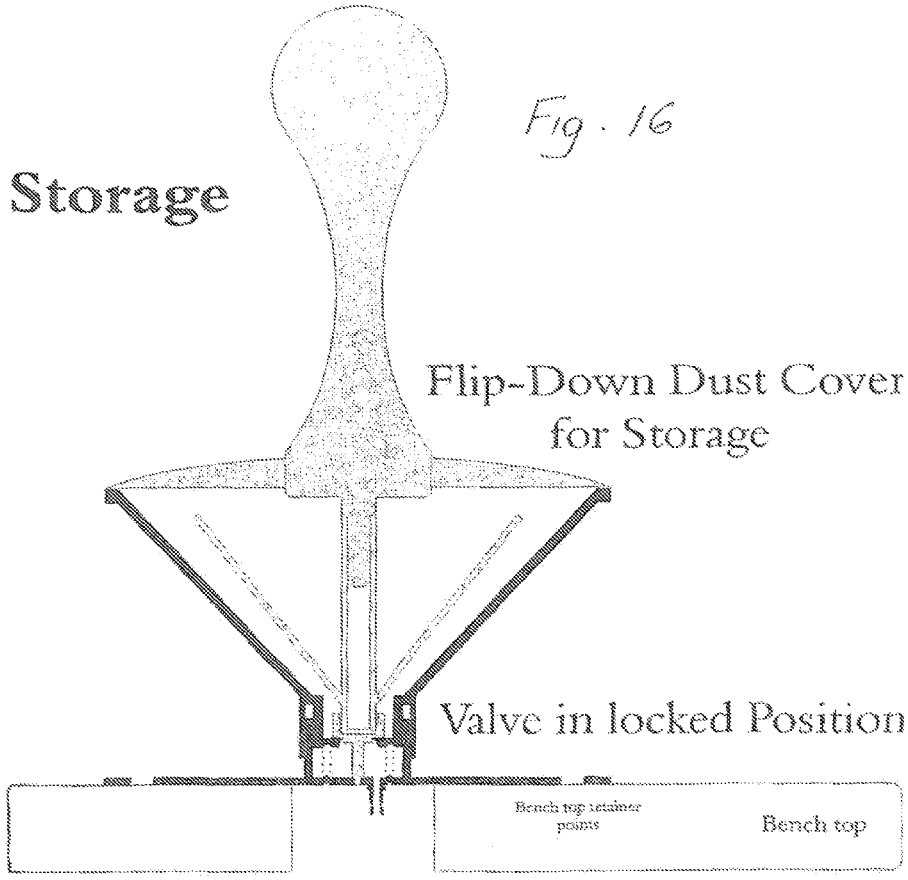

Storage
Flip-Down Dust Cover
for Storage
Valve in locked Position
Bench top retainer
points
Bench top

Fig. 16

Air Flow Regulated

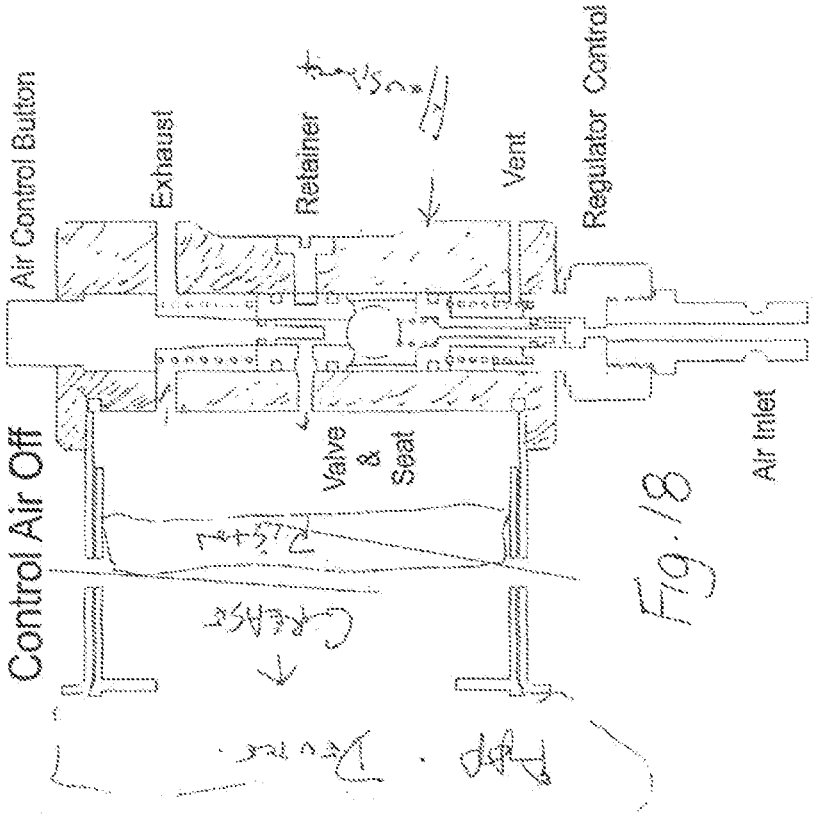


Fig. 18

Air Flow Restricted

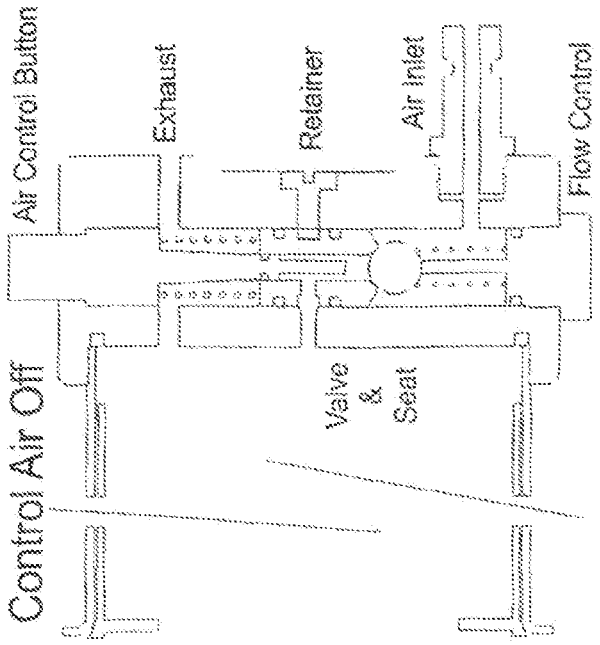


Fig. 17

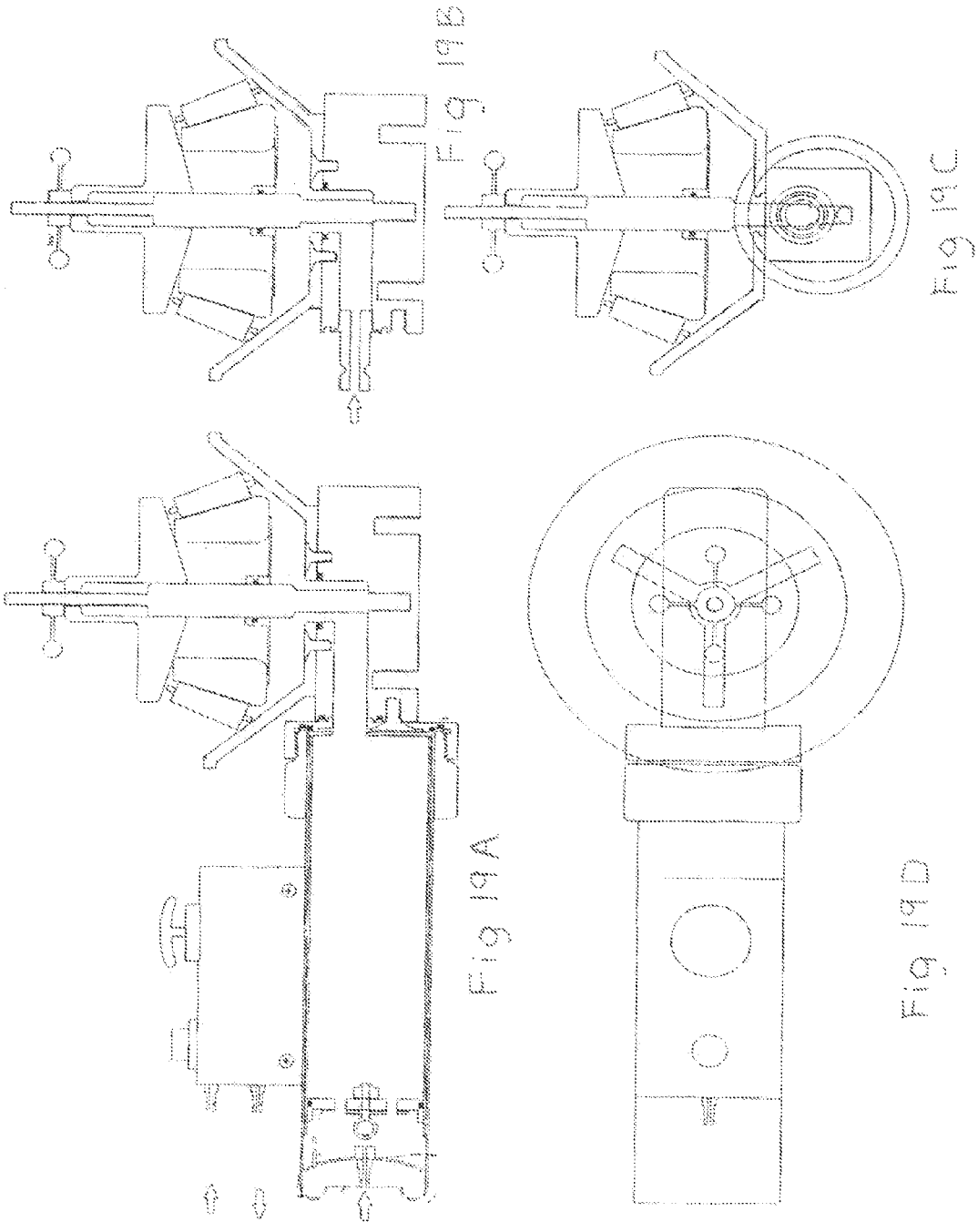


Fig 19B
Fig 19C
Fig 19A
Fig 19D

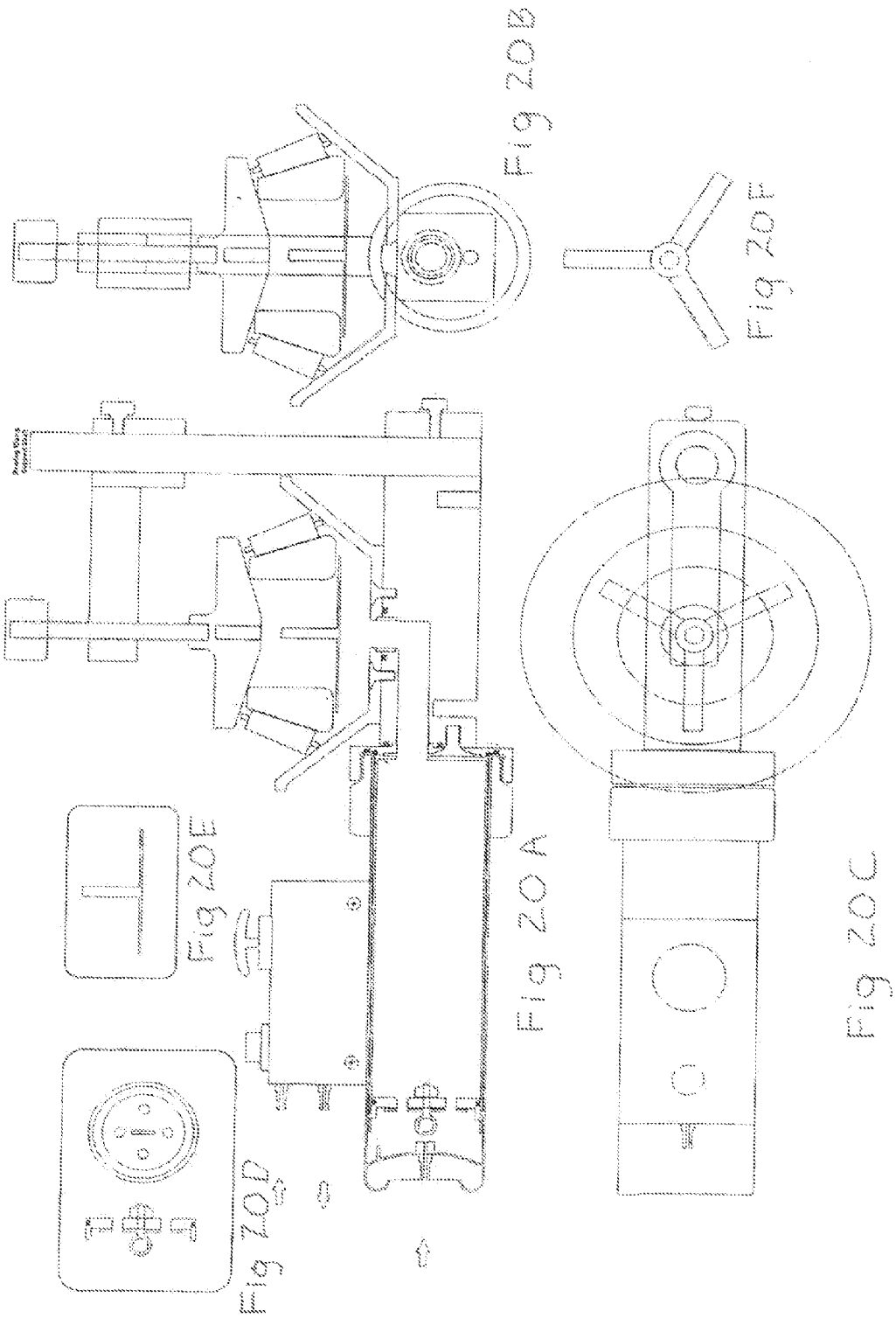
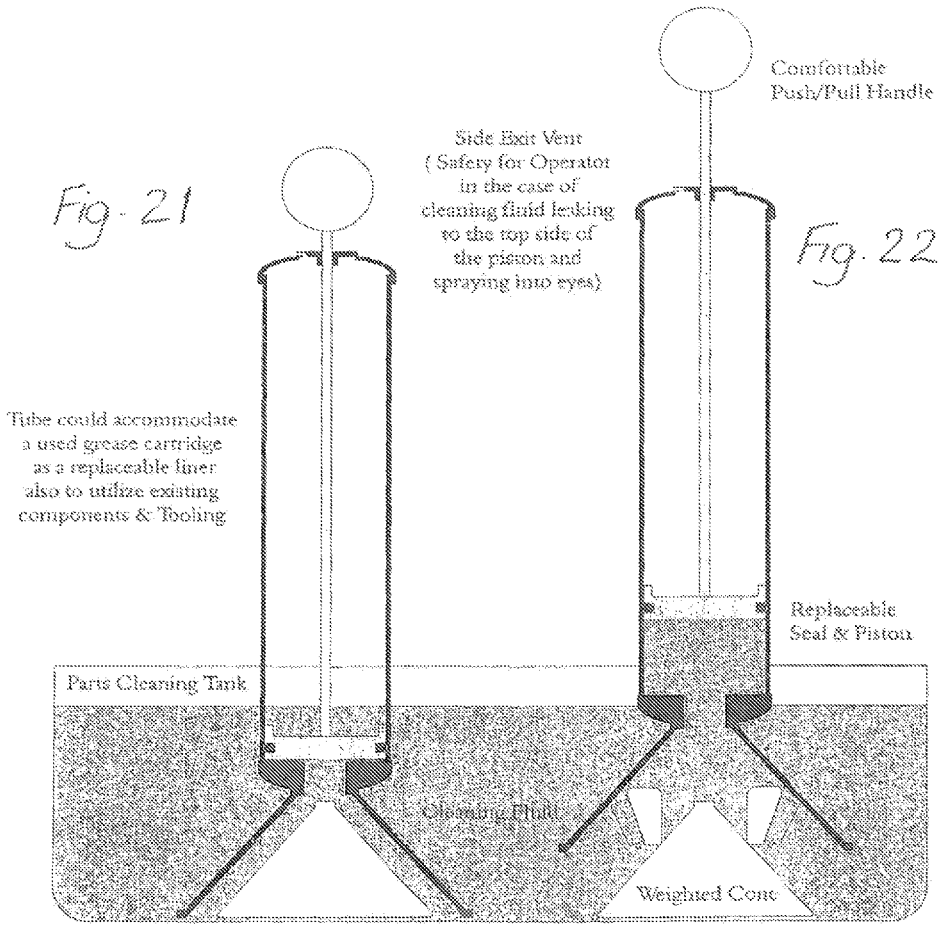


Fig 20B
Fig 20E
Fig 20A
Fig 20C
Fig 20E
Fig 20D



All materials suitable for use with detergents & degreasers

BEARING GREASE PACKER

CROSS-REFERENCE OT RELATED APPLICATION

This is a divisional of U.S. Ser. No. 12/598,291, filed Oct. 30, 2009, status pending, which is a Sect. 371 National Stage of PCT International Application No. PCT/AU2008/000549, filed on May 1, 2008, claiming priority of Australian Patent Application No. 2007902297, filed on May 1, 2007, the contents of both application hereby being incorporated by reference.

FIELD OF THE INVENTION

The present invention relates to a bearing lubrication tool and, in particular, to a tool for allowing bearing grease to be repacked into the bearing cage and against the rollers of bearings used in wheel hubs.

BACKGROUND OF THE INVENTION

Bearings, as used in the wheel hubs of motor vehicles, trailers, caravans, aircraft, agricultural equipment and the like, require lubrication from time to time. This is initially provided at the time of assembly of the bearing, but maintenance of wheel hub bearings is an on going requirement. On some four wheel drive vehicles, hub maintenance and repacking the bearings with grease is required at 30,000 km traveled. Aircraft bearings are serviced at 100 hrs flight time. These two examples alone show the many thousands of hours spent per day globally in the servicing of bearings of industrial, transport and recreational machines.

Bearing grease repacking is often performed manually. A blob of grease is pushed and rubbed by hand into the bearing cage and against the rollers. While this method does provide lubrication of the bearing, it adds the dirt from the operator's skin to the grease and it exposes the person's hand to the deleterious effects of grease. It also uses a large amount of hand towel for cleaning up and is time consuming. All of these factors add to the cost of performing bearing grease repacking, and run against the trend towards improved occupational health and safety practices.

It is, therefore, an object of the present invention to provide a bearing lubrication tool that avoids these problems.

SUMMARY OF THE INVENTION

According to the invention, there is provided as bearing lubrication tool comprising:

supply means for delivering a controlled amount of grease,

support means for locating a bearing in a position where a bearing cage and rollers of the bearing may be lubricated with the grease delivered by the supply means,

securing means for detachably coupling the supply means and the support means,

the supply means having a grease delivery outlet communicating with a grease delivery inlet of the support means,

a grease flow passageway for transferring grease received through the inlet to the bearing cage and rollers of the bearing,

a plate adapted to prevent grease entering the bore of the bearing, wherein the support means includes a clamp adapted to apply downward pressure on the bearing sufficient to prevent upward movement of the bearing when grease is transferred thereto,

the clamp being supported at a variable position relating to a shaft of the support means.

Preferably, the shaft is mounted to a base portion of the support means.

In a first preferred form, the base portion to which the shaft is mounted is to one side of the clamp, and the clamp is supported indirectly to the shaft by an arm assembly.

In a second preferred form, the base portion to which the shaft is mounted is beneath the clamp, and the clamp is supported directly on the shaft.

In this second preferred form, the clamp is threadably engaged to the shaft, and a nut is threadably engaged to the shaft above the clamp and is adapted to apply downward pressure on the clamp.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the Invention may be readily understood and put into practical effect, reference will now be made to the accompanying drawings, in which;

FIG. **1** is a partly sectioned side view of a bearing lubrication tool according to a first preferred embodiment of the invention,

FIG. **1***a* is an isolated end view of the piston of the supply means of the tool of FIG. **1**,

FIG. **2** is a top view of the tool of FIG. **1**,

FIG. **3** is a right side view of the tool of FIG. **1**,

FIG. **4** is an isolated top view of the clamp of the support means of the tool of FIG. **1**,

FIG. **5** is a partly sectioned side view of a bearing lubrication tool according to a second preferred embodiment of the invention,

FIG. **6** is a top view of the tool of FIG. **5**,

FIG. **7** is a right side view of the tool of FIG. **5**,

FIG. **8** is a partly sectioned side view of a bearing lubrication tool according to a third preferred embodiment of the invention,

FIG. **9** is a partly sectional side view of an assembly comprising a shaft, clamp and nut which may be used in a bearing lubrication tool according to a fourth preferred embodiment of the invention, the nut shown not applying downward pressure on the clamp,

FIG. **10** is a view similar to that of FIG. **9**, but with the nut shown applying downward pressure on the clamp, and

FIG. **11** is a bottom view of the nut of the assembly shown in FIG. **9**.

FIGS. **12** to **16** show side sectional views of a bench top bearing grease packer tool according to a further preferred embodiment of the invention,

FIGS. **17** and **18** show variations in the control of air flow from the regulator for delivering grease under pressure from the grease cartridge to the applicator,

FIG. **19**A is a front view of the first embodiment of the invention,

FIG. **19**B is an end view, from the right of FIG. **19**A thereof,

FIG. **19**C is an opposite end view thereof,

FIG. **19**D is a top, plan view thereof,

FIG. **20**A is a front view thereof,

FIG. **20**B is an end view, from the right of FIG. **20**A thereof,

FIG. **20**C is a top, plan view thereof,

FIG. **20**D is a detailed view of the piston thereof,

FIG. **20**E is a detailed view of the plate thereof,

FIG. **20**F is a detailed view of the bearing clamp thereof, and

FIGS. **21** and **22** show side sectional views of a bearing flush tool according to another aspect of the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

The bearing lubrication tool **10** shown in FIGS. **1** to **4** has a side mounted shaft **11**, and the bearing lubrication tools **12**,**14** shown in FIGS. **5** to **8** have a centre mounted shaft **15**.

The tool **10** includes two sub-assemblies, namely, a supply means in the form of a detachable grease cartridge air cylinder assembly **18**, and a support means in the form of a bearing packer head **18** for locating a bearing **40** to be lubricated by grease delivered by the detachable grease cartridge air cylinder assembly **16**.

A base **20** of the bearing packer head **18** is designed for use in either a work shop or a field environment, and can be held in the jaws of a vice or attached to a work bench by its bench top attachment points **22**. An air cylinder retainer nut **24** is attached to the base **20** and can be removed so that the bearing packer head **18** can be used without the detachable grease cartridge air cylinder assembly **16**. This option (see FIG. **8**) is useful for workshops that use large pneumatic/electric powered, remote grease storage drums. The bearing packer head **18** has provision made to attach a coupling **25** and connect to a remote supply by use of its coupling thread **26**.

The tool **10** allows the operator to repack bearings with grease quickly without needing to have grease on his or her hands. The air cylinder assembly **16** uses a commercially available pro-loaded grease cartridge **28**, which, when installed, may be emptied of grease when compressed air controlled by the operator is used to displace the piston **30**, thereby moving the grease through the grease passage **32** to a region **33** between a cone **84** and a plate **36**. As more and more grease enters the region **33**, grease first lifts the plate **36** which seals the bore defined by the inner race **39** of the bearing **40**, then moves to the only exit via the bearing cage and rollers **44**, thereby greasing the bearing **40** to the desired level of lubrication. The flow rate is regulated by use of an air switch and regulator device **46** to be described later. As the plate **36** lifts and contacts the Inner race **39**, the plate shaft **48**. Is used to visually sight and move the plate **36** to approximate centre so as to prevent entry of grease to the bearing bore. This is easy to accomplish as the bearing clamp **50** has three fingers **52** clamping the bearing **40** against the cone **34**, allowing adequate access to the plate shaft **48**.

The piston **30** used in the air cylinder assembly **16** is purpose made with the following features. As a commercially available pre-loaded grease cartridge is never totally full of grease, to insert a piston into the bore of the cartridge would allow trapped air to enter the grease passage **32** with the grease, the trapped air eventually finding its way into the cone region **33**, which could cause spattering of grease. To prevent this, the piston **30** has a valve arrangement, easily operated by turning the eye bolt **53** with its attached valve plate **54** and retainer **55**. This action vents the cartridge **28** to allow all the air to escape through vent holes **56** of the piston **30** as the piston **30** is inserted. When grease appears at the vent holes **56**, the eye bolt **53** is rotated a quarter turn to close the vent holes **56**.

The eye bolt **53** also functions as an attachment point for a cord, one end of the cord being thereby attached to the piston **30** with the other end of the cord being attached to an anchor point **57** located inside the blind end of the air cylinder assembly **16**. This provides a means for removing the piston **30** once the grease is exhausted.

The air cylinder assembly **16** includes a control device **46** comprising a self exhausting air switch needed to start and stop grease supply and a regulator for regulating the air pressure on the piston **30** so as to provide adequate control of grease supply. For the air pressure to be effective in the air cylinder assembly **16**. O-ring seals **60** are installed to seal the air cylinder assembly and to seal the grease cartridge **28** to the retainer nut **24**. This ensures the air pressure is effective only on the piston **30**, which also has an O-ring seal **60**. The diameter and length of the air cylinder assembly **16** are designed to suit the size of grease cartridge standard package sizes of different countries.

The bearing packer head **18** provides a simple means of retaining the bearing **40** during greasing operations. Once a bearing **40** is installed with a suitably sized plate **36**, the bearing clamp arm **62** is turned around the side mounted shaft **11** until centred over the bore of the bearing **40**, the bearing **40** and clamp **50** both finding centre due to the symmetrical shape of the cone **34** and taper of the bearing clamp **60**. After greasing, both retainer knobs **66**,**68** are easily loosened and the arm **62** and clamp **50** are lifted and turned to one side to gain clear access for lifting the bearing **40** clear of the cone **34**. The bearing bore is free of grease and so the now lubricated bearing **40** can easily be lifted up by gripping inside the bore.

It will be readily appreciated that the cone **34** and plate **36** can be produced in various sizes as options to the purchaser. The base **20** of the bearing packer head **18** can also be produced in various sizes to accommodate different applications.

The tool **12** shown in FIGS. **5** to **7** is different to the tool **10** shown in FIGS. **1** to **4** only in the way the bearing **40** is retained. In order to use a centre thrust bearing clamp **70**, a long, centre mounted shaft **15** with threaded sections and smooth sections is needed to provide clamping and also to allow the plate O-ring **72** to seal and slide. The bearing clamp **70** is such that a knurled section **71** above the three fingers **72** provides the operator with a handle for fitting and removing the clamp **70** to access the bearing **40** and plate **74**. A nut **76** is used to provide the clamping force required. The screw-on nature of the nut **76**, while standard, may prove time consuming, especially if the bearing is small and locates into the bottom of the cone.

The use of the nut **80** in the assembly shown in FIGS. **9** and **10** will overcome this problem, and make clamping fast and simple. The thread **81** of the centre mounted shaft **82** does not extend all the way to the top, allowing the nut **80** to quickly slide downwardly over the unthreaded part **84** of the shaft **82** and to centre over the clamp **70** end thread **81** of the shaft **82**. The four quarter nut sections **86**,**87**,**88**,**89** (see also FIG. **11**) have small magnets **90**,**92** inserted. These align with a corresponding set of like poled repelling magnets **94**,**96** set into the housing **98** of the nut **80**. As the nut **80** is lowered to contact the clamp **70**, the quarter nut sections **86**,**87**,**88**,**89** are deflected inwards against the magnetic repelling force, allowing the nut threads **100**,**102** to engage the shaft thread **81**. To simply retain the bearing **40**, the nut **80** is slid over the shaft **82** and the knurled section **71** of the clamp **70** is pressed downwardly and turned half a turn. After greasing, the nut **80** is reverse turned and lifted off the shaft **82**, followed by the clamp **70** and bearing **40**. The plate **74** can stay on the shaft **82** for the next bearing of the same size or can be removed therefrom and replaced with a plate of a different size to suit a different size bearing.

In practice, the speed of lubrication may be increased by greasing the smallest size bearings first and the largest ones last.

It will be apparent to persons skilled in the art that various modifications may be made in details of design and construction of the various bearing lubrication tools described above without departing from the scope and ambit of the invention. It will also be apparent that the nut **80** can have a wide range of uses, not only as part of an assembly (such as is shown in FIGS. **9** and **10**) which may be used in a bearing lubrication tool of the present invention.

The bench top bearing packer tool shown in FIGS. **12** to **16** includes supply means for delivering a controlled amount of grease, support means for locating a bearing in a position where a bearing cage and rollers of the bearing may be lubricated with the grease delivered by the supply means, the supply means having a grease delivery outlet communicating with a grease delivery inlet of the support means by a grease flow passageway, and means for controlling the passage of grease through the inlet to the bearing cage and rollers of the bearing.

The grease cartridge or tube is located remotely of the applicator so as to keep the bench top clean of unwanted equipment. As the grease cup or applicator will be exposed to dust settling upon it, a flip over dust cover with handle is provided that is, in this embodiment, moulded from a clear plastic. The clear plastic allows the user a better view of the greasing process. The lid of the cover is clicked over centre and the handle can also act as a lock to prevent inadvertent activation of the grease supply.

The embodiments shown in FIGS. **17** and **18** are of an air flow restricted embodiment and an air flow regulated embodiment.

FIG. **19**A is a front view of the first embodiment of the invention, FIG. **19**B is an end view, from the right of FIG. **19**A thereof, FIG. **19**C is an opposite end view thereof, FIG. **19**D is a top, plan view thereof, FIG. **20**A is a front view thereof, FIG. **20**B is an end view, from the right of FIG. **20**A thereof, FIG. **20**C is a top, plan view thereof, FIG. **20**D is a detailed view of the piston thereof, FIG. **20**E is a detailed view of the plate thereof, and FIG. **20**F is a detailed view of the bearing clamp thereof.

The bearing flush tool shown in FIGS. **21** and **22** may be used to clean grease from bearings in the manner as shown and described.

I claim:

1. A bearing lubrication tool comprising:

a) supply means for delivering a controlled amount of grease, the supply means including a detachable grease cartridge and air cylinder assembly located remotely of the support means, the grease cartridge being installed in the air cylinder and adapted to be emptied of grease when a supply of compressed air displaces a piston in the cylinder that moves the grease to the grease delivery inlet of the support means,

b) support means mounted on top of a work bench for locating a bearing in a position where a bearing cage and rollers of the bearing may be lubricated with the grease delivered by the supply means, the supply means having a grease delivery outlet communicating with a grease delivery inlet of the support means by a grease flow passageway, and

c) means for controlling the passage of grease through the inlet to the bearing cage and rollers of the bearing, the means for controlling including a valve assembly comprising a cup and a retainer, wherein relative movement between the cup and the retainer causes the valve assembly to assume an open condition for allowing grease to pass through the inlet to the bearing cage and rollers of the bearing.

2. The bearing lubrication tool of claim **1** wherein the cup supports the bearing and moves downwardly relative to the retainer by downward pressure exerted on the bearing.

3. The bearing lubrication tool of claim **2** wherein the downward pressure exerted on the bearing is applied through a downwardly pointing cone that is supported on the bearing and which is pressed downwardly by manual application of force on a handle device.

4. The bearing lubrication tool of claim **3** wherein the cone includes means for centering the position of the handle device relative to the cone.

5. The bearing lubrication tool of claim **4** wherein the centering means of the cone comprises an upwardly extending member which engages a downwardly extending member of the handle device.

6. The bearing lubrication tool of claim **5** wherein the upwardly extending member includes a female portion that engages a male portion of the downwardly extending member.

7. The bearing lubrication tool of claim **3** wherein the handle device includes a cover portion for covering the valve assembly when the bearing is not located in a position where it may be lubricated.

8. The bearing lubrication tool of claim **7** wherein the cover portion is made of a clear plastic to allow viewing of the passage of grease to the bearing.

9. The bearing lubrication tool of claim **1** wherein the grease delivery inlet is a detachable coupling to the support means or a grease supply port of the support means.

10. The bearing lubrication tool of claim **1** wherein the cup is supported by spring means and moves downwardly relative to the retainer against upward pressure exerted by the spring means.

11. The bearing lubrication tool of claim **10** wherein the spring means comprise coil springs that press upwardly against an annular seat of the cup, the annular seat having a central opening which, in the absence of downward pressure exerted on the bearing when supported by the cup, is sealed by the retainer so as to prevent passage of grease through the opening.

12. The bearing lubrication tool of claim **11** wherein the retainer is secured in a fixed position through the central opening, and includes a cradle adapted to engage a leading portion of the cone when the bearing is not located in a position where it may be lubricated.

13. A bearing lubrication tool comprising:

a) supply means for delivering a controlled amount of grease, the supply means including a powered grease storage drum located remotely of the support means, the powered grease storage drum adapted to be emptied of grease when a supply of compressed air moves the grease to the grease delivery inlet of the support means,

b) support means mounted on top of a work bench for locating a bearing in a position where a bearing cage and rollers of the bearing may be lubricated with the grease delivered by the supply means, the supply means having a grease delivery outlet communicating with a grease delivery inlet of the support means by a grease flow passageway, and

c) means for controlling the passage of grease through the inlet to the bearing cage and rollers of the bearing, the means for controlling including a valve assembly comprising a cup and a retainer, wherein relative movement between the cup and the retainer causes the valve

assembly to assume an open condition for allowing grease to pass through the inlet to the bearing cage and rollers of the bearing.

14. The bearing lubrication tool of claim **13** wherein the supply of compressed air is controlled by an air pressure regulator to allow the grease to flow at a regulated rate and be delivered in a controlled amount to the grease delivery inlet of the support means.

15. The bearing lubrication tool of claim **14** wherein the air pressure regulator maintains a constant air pressure and grease is caused to flow when the valve assembly assumes an open position.

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